

What is Claimed is:

1. A method for determining useful properties of individual building blocks of
5 a material library comprising a substrate having at least two individual
building blocks in at least two sections separated from one another, the
method comprising:
introducing at least one starting material into the at least two sections
of the substrate of a material library, which sections are separated from one
10 another, to carry out a chemical or physical or chemical and physical
reaction of the starting material in the at least two substrate sections
separated from another in the presence of a corresponding building block,
and obtaining an effluent comprising at least one reaction product and/or
starting material; and
15 analysing the effluent obtained in the reaction comprising at least one
reaction product and/or starting material, wherein the effluent is analysed
by recording and analysing at least one photoacoustic signal.
2. The method according to Claim 1 further comprising:
20 establishing the material library comprising the substrate having the at
least two individual building blocks in the at least two different sections of
the substrate which are separated from one another.
3. The method according to Claim 1, wherein the analysing step includes:
25 modulating in time a light source generating monochromatic light; and
detecting the photoacoustic signal with at least one microphone.
4. The method according to Claim 3, wherein the light source is a laser
modulated in at least one of frequency and amplitude.
- 30 5. The method according to Claim 3, further comprising arranging the at least
one microphone above at least one of the sections.
6. The method according to Claim 2, wherein the establishing, introducing,
35 and analysing steps are carried out in sequence.
7. The method according to Claim 1, wherein the introducing and analysing
steps are carried out in parallel to one another.

8. The method according to Claim 1, wherein the substrate is a tube-bundle reactor or heat exchanger and the sections are channels.
- 5 9. The method according to Claim 1, wherein the at least two individual building blocks have catalytic properties.
- 10 10. The method according to Claim 1, wherein the reaction is selected from the group consisting of decomposition of nitrogen oxides, synthesis of ammonia, ammonia oxidation, oxidation of hydrogen sulphide to sulphur, oxidation of sulphur dioxide, direct synthesis of methylchlorosilanes, oil refining, oxidative coupling of methane, methanol synthesis, hydrogenation of carbon monoxide and carbon dioxide, conversion of methanol to hydrocarbons, catalytic reforming, catalytic cracking and hydrocracking, carbon gasification and liquefaction, heterogeneous photocatalysis, synthesis of ethers, synthesis of MTBE, synthesis of TAME, isomerizations, alkylations, aromatizations, dehydrogenations, hydrogenations, hydroformylations, selective oxidations, partial oxidations, aminations, halogenations, nucleophilic aromatic substitutions, addition and elimination reactions, dimerizations, oligomerizations and metathesis, polymerizations, enantioselective catalysis, and biocatalytic reactions.
- 15 11. The method according to Claim 1, further comprising:
determining the activity, selectivity, and/or long-term stability of building
25 blocks which have catalytic properties.
12. The method according to Claim 4, wherein the light source is modulated by pulsing or chopping.
- 30 13. The method according to Claim 3, further comprising arranging a plurality of microphones, each microphone above a corresponding one of the sections.
14. The method according to Claim 3, further comprising arranging one
35 microphone above the substrate.
15. The method according to Claim 2, wherein the establishing, introducing, and analysing steps are carried out in parallel.

16. The method according to Claim 8, wherein the sections are tubes.
17. The method according to Claim 8, wherein the substrate is a block of a
5 solid material having regions.
18. The method according to Claim 8, wherein the substrate is a block of a
solid material having channels.
- 10 19. The method according to Claim 9, wherein the at least two individual
building blocks are heterogeneous catalysts and/or their precursors.
20. The method according to Claim 9, wherein the at least two individual
building blocks are inorganic heterogeneous catalysts and/or their
15 precursors.
21. The method according to Claim 9, wherein the at least two individual
building blocks are solid catalysts or supported catalysts and/or their
precursors.
- 20 22. The method according to Claim 9, wherein the at least two individual
building blocks are present as a catalyst bed.
23. The method according to Claim 9, wherein the at least two individual
25 building blocks are present as a tube-wall coating.
24. The method according to Claim 9, wherein the at least two individual
building blocks are present as an auxiliary support coating.
- 30 25. An apparatus for carrying out the method according to Claim 3,
comprising:
a holder to hold at least two individual building blocks comprising a
substrate having at least two different sections which are separated from
one another;
- 35 an inlet to introduce at least one starting material;
a detector to detect photoacoustic signals; and
analysing electronics for analysing the photoacoustic signals.